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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
SOUW, BERNARD E	
ART UNIT	**PAPER NUMBER**
2881	

DATE MAILED: 12/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/803,439	PEREL ET AL.	
	Examiner	Art Unit	
	Bernard E. Souw	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *Transm. 03/18/2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-58* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-58* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *3/18/04+9/7/05* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/18/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. Receipt is acknowledged of information disclosure statement (IDS) submitted on 03/18/2004. The submission is in compliance with the provisions of 37 CFR 1.97.

A signed copy of the information disclosure statement is here enclosed.

Specification

2. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-6, 9-12, 14-16, 20-26, 29-32, 34-36, 40-49 and 53-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nikoonahad et al. (USPAT 6,919,957).

Regarding claims 1, 2, 14, 21, 22, 34, 43-45, 47 and 53-58 Nikoonahad et al. disclose an ion implantation system suitable for use in implanting ions into one or more workpieces and for detecting particle on the workpieces, as recited in Col.27/ll.49-50, the ion implantation system comprising:

An ion implanter for producing a beam of ions and directing the beam of ions downstream toward the one or more workpieces held within an end station, as recited in Col.91/ll.24-26 and Col.95/ll.13-23, the end station comprising:

A rotary scan transport 24 shown in Fig.2A,B for providing rotary motion 28 to the workpieces and an encoder count of the radial scan position, as recited in Col.36/ll.44-52 (specifically in lines 49, 52); and a linear scan transport for providing reciprocating linear motion 29 to the workpieces, as recited in Col.36/ll.44-52 (especially in line 48), and an encoder count of the linear scan position, as recited in Col.37/ll.12-19 and Col.49/ll.31-35; and

an in-situ monitoring system 34 shown in Fig.3 associated with the end station suitable for detecting particles on the one or more workpieces 40 during ion implantation, as recited in the Title (line 3), the Abstract/ll.8-13, Col.2/ll.46-49 + 63-67, Col.53/ll.12-14 + 37-49 (specifically reciting the word "*particles*" in line 48) and Col.54/ll.5-10, the in-situ monitoring system 34 comprising:

a light source 36 or 44 shown in Fig.3+4 for providing a fixed beam of illumination to a portion of one of the workpieces 40, as recited in Col.37/ll.57-67 and Col.38/ll.1-16;

a detector 46 for capturing scattered light from the illuminated portion of the workpiece, as recited in Col.39/ll.23-31; and

a processor 54 shown in Fig.4+5, recited in Col.41/ll.12-24 and/or processor 270 shown in Fig.23, recited in Col.94/ll.60-67 and/or Col.111/ll.1-3, the processor configured to analyze the intensity of the scattered light detected from the illuminated workpiece, and for mapping the light detected to a unique position on a workpiece determined by the encoder counts associated with the rotary and linear transports, as recited in Col.49/ll.30-44, specifically in lines 33-35, but more generally in Col.67/ll.29-32.

Although the various device features and components recited above belong to different embodiments in Nikoonahad's invention (e.g., Fig.2A,B belong to an ion implanter system, whereas Fig.3-5 belong to an optical measurement/detection system), they all belong to one implantation system, as recited in Col.27/ll.49-50.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the different embodiments or parts of Nikoonahad's invention, as identified previously, into an ion implantation system similar to applicant's claimed invention, since those features and components are parts of a general implantation system, as taught by Nikoonahad et al. in Col.27/ll.49-50.

One of ordinary skill in the art would have been motivated to modify Nikoonahad's general implantation system including scanning or specimen transport mechanism by Nikoonahad's in-situ monitoring system 34 comprising the optical detection system 34, signal processor 54 shown in Fig.3-5, or processor 270 shown in Fog.23 (or many other figure drawings throughout Nikoonahad's document) , since

those components belong to one comprehensive invention, and hence, can be combined to serve the same purpose.

There is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is what the combination of disclosures taken as a whole would suggest to one of ordinary skill in the art. *In re McLaughlin*, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to one versed in the art, rather than by their specific disclosures. *In re Bozek*, 163 USPQ 545 (CCPA) 1969.

In this specific case, the rationale to modify and/or combine Nikoonahad's ion beam radiation & scanning system, specimen stage with rotational and translational transport, optical detection/inspection system, processing system, imaging system, etc., into an ion implantation system, does not have to be expressly stated in the Nikoonahad's reference; in the present case the rationale is reasoned from knowledge generally available to one of ordinary skill in the art. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

This relates to suggestion/motivation in that "having established that this knowledge was in the art, the Examiner could then properly rely on a conclusion of obviousness 'from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference'." *In re Bozek*, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969).

► Claim 21 recites the same limitations as claim 1.

► Claims 43-45 recite a method comprising steps that are specifically implemented by the implantation system of claim 1 or claim 21.

► Claims 53-58 recite altogether the same limitations as claims 1 and 21.

► Regarding claims 2, 14, 22, 34 and 47, the limitation of a display device is already included in the limitation of "*mapping the detected light*" recited in claim 1, but more specifically recited in Col.5/ll.30-32, Col.49/ll.45-67, Col.50/ll.1-27 and Col.66/ll.17-20.

► Regarding claims 3 and 23, the various types of defects are recited in Col.52/ll.51-67 and Col.53/ll.1-62.

► Regarding claims 4, 24 and 46, the limitation of the processor's capability to trigger an alarm if a threshold level regarding an observed defect is detected, is recited in Col.66/ll.15-24, whereas the recitation of disabling the implantation process is recited in Col.97/ll.21-43 (specifically lines 40-43) and Col.95/ll.1-12 (specifically lines 8-12).

► Regarding claims 5 and 25, the limitation of a plurality of workpieces is recited in Col.84/ll.54-58 and Col.105/ll.29-35.

► Regarding claims 9 and 29, a computer as part of the processing system is recited in Col.50/ll.14-16.

► Regarding claims 10 and 30, photodetector 46 as part of detection system 38 in Fig.3-5 is recited in Col.38/ll.16-27.

► Regarding claims 11 and 31, Nikoonahad's system 32 is equipped with two detectors 46 shown in Fig.5, and 46a and 46b shown in Fig.12, the detectors affixed on either side of the light source 44, and both detectors oriented towards the workpiece 40

illuminated by light source 44, as recited in Col.39/ll.48-67 in reference to Fig.5, and in Col.51/ll.56-66 in reference to Fig.12.

► Regarding claims 20 and 42, Nikoonahad's system 32 is equipped with two dissimilar detectors 46, as recited in Col.39/ll.48-67 + Col.40/ll.1-2, with one detector measuring scattered light and the other measuring a wavelength of the electromagnetic radiation, as expressly recited in Col.39/ll.66-67 + Col.40/line 1.

► Regarding claims 6, 12, 26 and 32, a laser is shown in Fog.3,4 by numeral 36 or 44, as recited in Col.38/ll.4-8.

► Regarding claims 15 and 35, the limitation of a batch implanter is recited in Col.84/ll.54-61 and Col.105/ll.28-30 + 43-52, wherein a load lock chamber equipped with a robot manipulator to accommodate a large amount of workpieces is known in the art as being the same as a batch implanter.

► Regarding claims 16 and 36, the limitation of a rotating disc has been previously rejected in the parent claims 1 and 21, referring to rotary motion 28 of rotary stage (=spinning disc) 24 shown in Fig.2A,B, now in combination with a plurality of workpieces expressly recited in Col.84/ll.54-58 and Col.105/ll.29-35 in a batch system already rejected in parent claims 15 and 16, respectively.

► Regarding claim 40, a compound motion of rotational and linear transport for detection and implantation scanning driven by one or more drives is recited in Col.36/ll.23-26, as shown by rotation motion vector 28 and linear motion vector 29.

► Regarding claim 41, a compound motion of rotational and linear transport for detection and implantation scanning driven by separate drivers is recited in Col.36/ll.17-29 and 44-52, as shown by rotation motion vector 28 and linear motion vector 29.

► Regarding claims 48 and 49, it would have been an obvious matter of design choice to perform the detection step either before or after the implantation, since applicant has not disclosed that any of the two possible steps solves any stated problem or has any particular purpose, and it appears that the invention would perform equally well with either detecting step before or after implanting step. Therefore, Applicant's step according to claim 48 or 49 is mere matter of design choice that is unpatentable, because it only involves routine skill in the art.

5. Claims 50 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nikoonahad et al. in view of Green et al. (USPAT 4,377,340).

Nikoonahad et al. show all the limitations of claim 50 as previously applied to the parent claim 43, except the specific recitation of estimating a size of a detected particle based on the detected magnitude of the scattered light.

Green et al. disclose an optical system for detecting particles on a substrate similar to Nikoonahad's, as illustrated in Fig.1, recited in the title and described in Col.4/ll.30-57. Green's detection system is capable of measuring the size of the particles from the magnitude of the detected scattered light, as recited in Col.4/ll.30-33.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Green's detection system in Nikoonahad's implantation

system, since particle size is an important parameter for semiconductor processing, as generally known in the art.

One of ordinary skill in the art would have been motivated to modify Nikoonahad's system by Green's detection system, since by knowing the particle size in addition to other parameters the nature of the contaminants may be further investigated and ultimately determined.

► Regarding claim 51, the limitation of binning the detected particles into one of a plurality of bins associated with estimated detected particle ranges is recited By Nikoonahad et al. in Col.140/ll.53-61.

6. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nikoonahad et al. in view of Green et al. and further in view of Windham et al. (USPAT 6,587,575).

Nikoonahad et al. as modified by Green et al. show all the limitations of claim 52 as previously applied to the parent claims 1 and 51, except the specific recitation of investigating one or more particle contamination sources based on the binning of the detected particles.

Windham et al. disclose a method for contaminant detection, in which a binning of contaminant particle size is involved, as shown in Fig.2 (step 2.8) and recited in Col.15/ll.9-14. Windham's method further constructs from the binned particle size in combination with other measured contaminant parameters a histogram, that may be

used to investigate, i.e., to identify and find the location of, possible contamination sources, as depicted in Fig.2, step 2.14 and 2.16, and recited in Col.16/ll.1-6.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to adopt Windham's method of histogram analysis in Nikoonahad's particle detection system as modified by Green et al., since the nature and the source of wafer contaminants in the implantation system may eventually be determined.

One of ordinary skill in the art would have been motivated to adopt Windham's method of finding the source of contaminants, since the latter may be ultimately eliminated, thus resulting in high quality semiconductor devices.

7. Claims 7 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nikoonahad et al. in view of Boppart et al. (USPAT 6,485,413) and Scaiano et al. (USPAT 6,7413,347)

Nikoonahad et al. show all the limitations of claims 7 and 27, as previously applied to their respective parent claims 1, 6, 21 and 26, except the specific recitation of an optical fiber to direct laser light to the workpiece. Boppart et al. disclose an optical scanning instrument shown in Fig.2 in which an optical fiber directs a laser beam from source 10 to the workpiece (sample), as recited in Col.7/ll.9-24.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Nikoonahad's detection system by delivering the illumination through an optical fiber as taught by Boppart et al., since the use of optical fiber makes the optical alignment easier, as generally known in the art.

One of ordinary skill in the art would have been motivated to modify Nikoonahad's detection system by using Boopart's fiber optics light delivery, since the use of fiberoptics significantly reduces the overall size of the instrument, thus rendering possible to design it as a portable device, as taught by Scaiano et al. in Col.1/ll.64-67.

As generally known in the art, a small-size and portable instrument is always more desirable than a bulky and stationary one.

8. Claims 8, 13, 28 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable Nikoonahad et al. in view of Kramer et al. (USPAT 5,028,139).

Nikoonahad et al. show all the limitations of claims 8, 13, 28 and 33, as previously applied to their respective parent claims 1, 6, 21 and 26, except the specific recitation of a trap to extinguish spectacular reflection of light scattered by the sample.

Kramer et al. disclose an optical detection apparatus as shown in Fig.3 and Fig.2 (Kramer's prior art), comprising a light source 32, sample 42, detector 36 and trap 44. Kramer's trap 44 is intended to extinguish spectacular reflection of light scattered by the sample 42, as recited in Col.5/ll.33-52.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a trap as taught by Kramer et al. to extinguish spectacular reflection of light scattered by the sample, since specular reflected light is known to strongly falsify the measurement.

One of ordinary skill in the art would have been motivated to modify Nikoonahad's implantation system by adopting Kramer's optical detection system that

employs a light trap to extinguish spectacular reflection of light, in order to obtain accurate measurement with high signal-to-noise-ratio.

► Specifically regarding claims 13 and 33, the further limitation that the trap is located in between two detectors is rendered obvious by Kramer's more than one detector, as recited in the Abstract/ll.1-12, specifically lines 7-10.

In case two detectors are being used, it would have been obvious to one of ordinary skill in the art at the time the invention was made to place the trap between the two detectors, in order to minimize the number of components, cost and labor.

One of ordinary skill in the art would have been motivated to modify Kramer's trap shown in Fig.2 and Fig.3 by a single trap placed between two detectors, since the rationale to modify Kramer's invention does not have to be expressly stated in the Kramer's reference; in the present case the rationale is reasoned from knowledge generally available to one of ordinary skill in the art. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

This relates to suggestion/motivation in that "having established that this knowledge was in the art, the Examiner could then properly rely on a conclusion of obviousness 'from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference'." *In re Bozek*, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969).

9. Claims 17-19 and 37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable Nikoonahad et al. in view of Imai (USPAT 5,633,698), Chang et al. (USPAT 6,062,084), Sharts et al. (USPAT 6,307,625) and Green et al.

Nikoonahad et al. show all the limitations of claims 17 and 37, as previously applied to their respective parent claims 1, 6, 21 and 26, except specific recitations that the workpiece is held at a non-zero angle relative to a plane of rotary motion.

Nikoonahad's workpiece is held at a non-zero angle relative to the ion beam, as recited in Col.49/ll.45-54, especially lines 51-52 and in Col.50/ll.30-37. However, Nikoonahad's workpiece is not held at a non-zero angle relative to a plane of rotary motion. Imai discloses a beam exposure apparatus as shown in Fig.1 and 2. Imai's wafer holder shown more in detail in Fig.2 includes a tilting table 4 and a rotation table theta for mount the workpiece 1 at a non-zero angle relative to the plane of rotary motion, as recited in Col.1/ll.45-48 and Col.6/ll.58-62.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Nikoonahad's by Imai's teaching of holding the workpiece at non-zero angle relative to the plane of rotary motion, in order to minimize reflection of the illumination towards the detector, as taught by Chang et al. in Col.1/ll.47-56.

One of ordinary skill in the art would have been motivated to modify Nikoonahad's apparatus by Imai's holding the workpiece(s) at non-zero angle relative to the plane of rotary motion in order to minimize reflection of the illumination that may lead to defects not being detected, as taught by Imai in Col.1/ll.50-52.

► Still regarding claims 17 and 37, Sharts et al. use a slit (as part of monochromator 110 shown in Fig.1) to pass scattered light from sample 106 to detector 111, as recited in Col.5/ll.45-67 and Col.6/ll.1-15, wherein the slit automatically mask specular-reflected light from entering the monochromator, as generally known in the art.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to adopt Sharts' teaching of using a slit to mask specular-reflected light from entering the monochromator, since the slit also serves as a spatial filter that is conventionally used in the art to keep stray light -- including specular reflection -- away from the detector, as taught by Green et al. in Col.4/ll.42-44.

One of ordinary skill in the art would have been motivated to modify Nikoonahad's and Imai's teaching by Sharts' use of a slit as a spatial filter, since a spatial filter is known to help increase the signal-to-noise ratio of the measurement significantly. In this regard Sharts' slit effectively serves as a mask that reduces the stray light, as taught by Green et al. in Col.4/ll.37-50.

► Regarding claims 18 and 38, Sharts' detection system comprises a first lens 107 that collimates the scattered light and a second lens 108 that focuses the light scattered by the sample 106 towards the detector 111, and a slit as part of monochromator 110 to detector 111, as recited in Col.5/ll.45-67 and Col.6/ll.1-15. Sharts' device also comprises a filter 109 to absorb unwanted wavelengths, as recited in Col.5/line 57 and Col.6/ll.9-11.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Nikoonahad's implantation system with Sharts' optical

detection system comprising collimating and focusing lens with an absorption filter in between to focus the scattered light onto a slit serving as spatial filter, since an absorption filter is most effective if being used if the light is collimated, hence covering a maximal area of the filter, as generally known in the art.

One of ordinary skill in the art would have been motivated to modify Nikoonahad's system by Sharts' detection system comprising a slit as a spatial filter, since a spatial filter is known to help reduce the signal-to-noise ratio of the measurement significantly. In this regard Sharts' slit effectively serves as a mask that reduces the stray light, as taught by Green et al. in Col.4/ll.37-50.

► Regarding claims 19 and 39, Sharts' detection system passes the scattered light from the first lens 107 to the detector (110+111) in an optical column, the order of the optical column comprising the first lens 10 7, the filter 109, the second lens 108, the slit (entrance and exit of monochromator 110) and the detector 111, as can be seen in Fig.1.

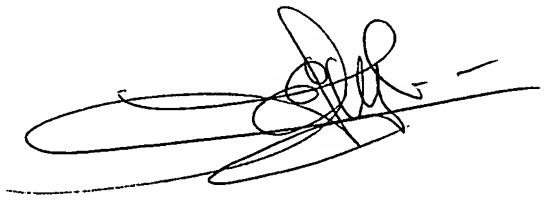
Communications

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bernard E Souw whose telephone number is 571 272 2482. The examiner can normally be reached on Monday thru Friday, 9:00 am to 5:00 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R Lee can be reached on 571 272 2477. The central fax phone

number for the organization where this application or proceeding is assigned is 571 273 8300 for regular communications as well as for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571 272 5993.



Bernard E. Souw

Patent Examiner – AU 2881

December 22, 2005